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Report Documentation Page

Form Approved
OMB No. 0704-0188

1. REPORT DATE	2. REPORT TYPE	3. DATES COVERED
MAR 2007		**00-12-2006 to 00-03-2007**

4. TITLE AND SUBTITLE	
Balanced Innovation Management	5a. CONTRACT NUMBER
	5b. GRANT NUMBER
	5c. PROGRAM ELEMENT NUMBER
6. AUTHOR(S)	5d. PROJECT NUMBER
	5e. TASK NUMBER
	5f. WORK UNIT NUMBER
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) **Office Assistant Secretary of Air Force,F-22 Program Executive Office,Wright Patterson AFB,OH,45433**	8. PERFORMING ORGANIZATION REPORT NUMBER
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)	10. SPONSOR/MONITOR’S ACRONYM(S)
	11. SPONSOR/MONITOR’S REPORT NUMBER(S)

12. DISTRIBUTION/AVAILABILITY STATEMENT

Approved for public release; distribution unlimited

13. SUPPLEMENTARY NOTES

Defense AR Journal, December 2006-March 2007

14. ABSTRACT

15. SUBJECT TERMS

16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON
a. REPORT	b. ABSTRACT	c. THIS PAGE			
unclassified	**unclassified**	**unclassified**	**Same as Report (SAR)**	**20**	

Standard Form 298 (Rev. 8-98)
Prescribed by ANSI Std Z39-18

BALANCED INNOVATION MANAGEMENT

Lt Col David R. King, USAF

The Department of Defense has demonstrated success in managing innovation. The military's approach to innovation management extends beyond traditional distinctions between internal and external innovation modes. Summarizing specific innovation strategies available to managers develops recognition of this growing reality. The article concludes with resulting lessons that can be more widely adopted by managers.

The management of innovation and change is vital to organizations, and organizations face increased demands to develop and monitor new knowledge. Managing innovation has only become more difficult with faster technology change and diffusion. Often the context of an innovation plays a greater role in a successful outcome than the merit of the underlying idea. For example, Leonardo da Vinci sketched a parachute during the 15th century, but neither the need nor materials to produce a parachute existed for centuries. The strategies behind innovation successes by the Department of Defense (DoD) warrant review, so organizations can pursue balanced innovation management. Traditionally, choosing an innovation mode involved a selection of either internal development or external acquisition. However, DoD innovation management practices help outline a wider selection of innovation management strategies available to organizations.

There are at least two reasons to examine military innovation management. First, innovative technology from the military has had wide-ranging and long-lasting impacts. For example, since World War II, the military has supported the research of 58 percent of the U.S. recipients of the Nobel Prize for chemistry and 43 percent of the U.S. recipients of the Nobel Prize for physics (Lieberman, 1999). The second reason for examining the innovation practices of the military is that over time a "glass-like firewall" has developed between military and private sector management (Stever, 1999). This firewall has inhibited the transfer of knowledge between the

military and private sectors, and increases the need to share management practices. One obstacle involves the shorter product cycle for commercial applications that offers a faster return on investment than most defense weapon systems. Another consideration relates to the military sector evolving as firms specialize in government contracting practices that are often unfamiliar to commercial firms. This can contribute to reluctance by commercial firms to do business with the government without partnering with a firm specializing in government contracting.

The innovation challenges faced by the military and private sectors are more aligned in the present, representing an opportunity to review and apply military innovation management strategies. This article summarizes some specific innovation strategies available to managers, describes how the military applies these innovation strategies, and then infers lessons that could be more widely adopted.

GENERIC INNOVATION MODES

Innovation is crucial because the competitive environment that organizations face is not static. Developing new technology is inherently a long and uncertain process. Whether technology development will result in success or failure is often not known until late in the development process. Different innovation modes offer dissimilar rewards (and drawbacks) requiring informed management and an organization flexible enough to pursue different alternatives. Table 1 summarizes generic innovation modes along with their advantages and disadvantages.

INTERNAL

Internal research and development (R&D) represents the cornerstone of innovation strategy. It allows organizations to control and profit from mature technologies by developing knowledge and an ability to recognize and exploit opportunities. Initial benefits from R&D, such as uncertainty reduction, may be

TABLE 1. GENERIC INNOVATION MODES AND OUTCOMES

	Internal	Hybrid	External
Examples	• R&D	• Alliance • Joint Venture	• Acquisition • License
Advantages	• Maintains internal technical ability	• Share costs with partner(s)	• Provides faster and more complete access to needed resources
Disadvantages	• Requires large investment in uncertain efforts • Relatively slow	• Enables competitors • Conflicts of interest	• Holders of critical resources capture the majority of gains • Uncertain contribution to internal technical ability

limited to organizations investing in R&D, which increases the attractiveness of performing internal development. Internal development maintains causal ambiguity that hinders imitation and helps differentiate organizations from competitors. However, research is expensive, time intensive, and risky, with 46 percent of research going toward products that ultimately fail (Hudson, 1994).

HYBRID

Hybrid innovation combines both internal and external resources. Alliances are a frequently used form of collaboration between organizations that can take multiple forms to serve different purposes. For example, alliances may involve competitors, suppliers, government or university laboratories, and venture capitalists. The different reasons for pursuing alliances include attempts at standard setting, overcoming strategic resource vulnerabilities (e.g., R&D, marketing, or manufacturing), entering new markets, gaining legitimacy, and so on. Alliances offer faster access to needed resources than internal development and also facilitate organizational learning. For example, learning in alliances may lead to either partner no longer needing to participate in an alliance. As a result, alliances can be inherently instable and experience a 50 percent failure rate (Inkpen & Beamish, 1997).

EXTERNAL

Acquisitions and licensing represent opportunities to pursue innovation using external resources. Acquisitions involve transactions where one organization purchases or combines with another organization and its resources, while licenses are contracts that typically transfer patent rights, or codified knowledge. Acquisitions and licensing offer the advantages of providing faster and more complete access to needed resources than other innovation modes. Accessing external resources is often pursued when needed internal resources are nonexistent. This is a common DoD limitation that has contributed to the use of external resources.

Acquisitions can also help overcome problems in the exchange of resources by internalizing them within a single organization (Williamson, 1975). Meanwhile, limitations imposed in the pursuit of other innovation modes may encourage licensing. For example, antitrust concerns may lead organizations to license critical technology or be required for an independent joint venture to share technology with participating organizations (Katz & Shapiro, 1987; Shapiro, 2001). However, external innovation has high failure rates, with half of acquisitions failing and the advantages of licensing being offset by lower profitability (Porter, 1987).

BALANCING INNOVATION STRATEGIES

Successful application of generic innovation strategies remains elusive with research suggesting that failure may often result from managers either pursuing innovation or neglecting it (Lord, deBethizy, & Wagner, 2005). Innovation represents a collective process that results from the creation of new knowledge through intra- and inter-organization interactions (Castellacci, et.al., 2005). An

TABLE 2. SPECIFIC INNOVATION STRATEGIES

Internal	Hybrid	External
• Centers of Excellence • Product Experiments • Develop Personnel	• Science Boards • Venturing • Competitive Intelligence	• R&D – Outsource – Subsidize • Sponsor Competitions

implication is that managers continually generate innovation strategies as a response to competitive pressures to innovate and reduce costs. Therefore, organizations need to be able to select from a more diverse field of innovation modes.

Table 2 summarizes more specific innovation strategies available to managers. Reviewing additional options for innovation that fall within the generic innovation modes offers several advantages. First, it helps delineate actual means for pursuing generic innovation strategies. This offers the additional benefit of expanding the options available to managers in enacting innovation. Second, it expands the repertoire of organizational actions that researchers should consider as demonstrating a support of innovative activity.

Specific internal innovation strategies include creating centers of excellence, performing product experiments, and developing personnel. Centers of excellence represent portions of an organization that focus on an organization's knowledge. While centers of excellence are intended to attract world-class researchers, they should not be confused with centralized R&D, but colocated with product development. Additionally, centers of excellence offer an opportunity for personnel rotation to increase the exchange of information and knowledge crucial to innovation. Product experiments can help confirm that markets exist for the technology. They also offer an opportunity to speed development by putting prototypes in the hands of users in realistic settings. Pushing prototypes into the hands of lead users helps ensure useful applications for military research exist and focuses attention on applying technology versus just creating it. Formalized personnel exchanges designed to develop personnel and trade information also enable organizations to build and retain key employee skills. For example, lifetime employment by Japanese firms helped create learning organizations by developing and integrating hourly and salaried workers—factors that contributed to that country's innovation success (Castellacci, et al., 2005).

Science boards, venturing, and competitive intelligence represent specific hybrid innovation strategies. Science boards leverage external experts by bringing them in to address continuing or specific organization concerns. Science boards need to have a strategic view that integrates senior people familiar with both user requirements and leading technology to enable them to effectively steer research toward useful applications. Venturing represents an option for nurturing potentially disruptive technology separate from an organization's established operations. The goal of venturing is to create strategic value and venture investments that can help signal legitimacy (Sykes, 1990). Finally, competitive intelligence involves efforts to learn about competitor's products.

Specific external innovation strategies relate to outsourcing and subsidizing external R&D, and sponsoring competitions. Outsourcing R&D recognizes that it is virtually impossible to have all needed expertise required at any given time within an organization. In these situations, time and other factors demand that expertise be accessed where it can be found. Subsidizing R&D is more proactive and it builds relationships with key suppliers. Sponsoring R&D in an organization's suppliers helps ensure that external organizations' managers pursue their areas of interest.

MILITARY INNOVATION MANAGEMENT

The DoD uses diverse methods of managing innovation. Diversity helps ensure multiple innovative ideas, perspectives, and options remain available to senior military decision makers. The discussion here is not intended to review all approaches to military innovation management. Instead, the focus is on describing specific innovation strategies that translate to the private sector.

CENTERS OF EXCELLENCE

The U.S. military has a demonstrated commitment to supporting internal R&D. The armed services maintain research laboratories dedicated to supporting their particular needs. For example, Air Force laboratories employ over 9,000 personnel and help manage approximately $3 billion in research projects (Air Force, 2005). The laboratories focus on technologies with military applications and are typically colocated with organizations tasked with developing and fielding products depending on these technologies. These centers of excellence provide an opportunity to co-locate people applying technology with experts in those areas, giving users access to the latest knowledge. Additionally, centers of excellence offer a location to rotate personnel and further information exchange.

The goal of Air Force laboratories is to pioneer aerospace technology by investing in new technology, prototyping technology, and providing technical expertise to Air Force leadership. Air Force laboratories are located in centers of excellence that include organizations responsible for developing and fielding technology. The laboratories in these centers focus on multiple areas of technology with potential military applications including: air and space vehicles and propulsion, directed energy, information technology, materials and manufacturing, munitions, and sensors.

Laboratories perform internal R&D for the military in settings that consider military-specific applications for monitoring and developing technology, and they offer many success stories, including advances in nano-technology infrared detection (Air Force, 2006). However, a noteworthy achievement in support of Operation Desert Storm in 1991 involved the design and delivery of a new weapon literally warm to the touch in only 28 days. The weapon was the GBU-28 hard target penetrator munition (HTPM), designed to attack Iraqi bunkers (Schoonover, 1994). Similarly, the U.S. military developed a thermobaric weapon to use against cave complexes in Afghanistan.

PRODUCT EXPERIMENTS

The military pursues technology demonstrations in realistic settings with the goal of maturing technology and facilitating its adoption. Under a program called Advanced Technology Concept Demonstrations (ACTD), the military experiments with technology prototypes in realistic settings that parallel private sector efforts at commercialization. Technology demonstrations place actual users and prototypes in realistic settings. This enables the military to respond rapidly to emerging needs in an environment where technology is in a constant state of flux. Since 1994, ACTD programs have provided the ability to rapidly prototype technology and evaluate it during military exercises to determine its long-term utility. The demonstrations allow users, who may have limited understanding and experience with a new technology, to evaluate technology solutions in situations similar to how it may actually be used.

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The impact of ACTD programs was recognized early on, when a 1995 ACTD of the Predator Unmanned Aerial Vehicle (UAV) created an immediate and lasting demand for remotely piloted vehicles. Even before the 19-month demonstration was completed, Predator aircraft were deployed to Bosnia in support of Operation Allied Force (Thirtle, Johnson, & Birkler, 1997). The Predator UAV has changed technology requirements and put new emphasis on satellite communications, and removed the requirements for human support systems (e.g., displays, life support, and ejection seats). This shift in technology has created a $10 billion market that was essentially created by putting a technology prototype in the hands of lead users in a realistic setting (Nick, 2003).

DEVELOP PERSONNEL

The military uses educational benefits to attract and retain personnel at all levels. Education benefits are offered to entry-level personnel as part of formal career development. Education programs focus on civilian degree programs, military professional training, and specialty training and certification programs. Air Force efforts in this area are captured under the umbrella of force development (Hassan, 2005). The concept of force development is to ensure personnel have the leadership, technical, and business skills that they need to succeed.

The military also actively rotates its personnel to broaden their experience and perspectives. This includes actively assigning people in the military to work full-time in defense contractor plants (i.e., suppliers), both in government and

contractor roles. The Defense Contract Management Agency (DCMA) provides in-plant representatives that serve as information brokers. Additionally, the Air Force sponsors personnel to work in industry for a year as part of an Education with Industry (EWI) program. Personnel rotation and educational benefits help ensure a cross-fertilization of people and ideas that can later be applied elsewhere.

SCIENCE BOARDS

The Defense Science Board (DSB) advises the Secretary of Defense and Chairman of the Joint Chiefs of Staff and was established in 1956 as part of the recommendations from the Hoover Commission (Defense Science Board). Task forces comprised of board members supplemented by area experts address tasks assigned to the DSB by Department of Defense (DoD) leaders. Results from each task force are presented to the DSB and appropriate DoD officials, and are documented in a written report summarizing relevant findings and recommendations.

An example of a recent DSB study involved examining the impact and implications of unmanned aerial vehicles on military operations. The emerging use of UAVs in combat represents an innovation that will have implications for military force structure and investment decisions. For example, a Predator UAV used a Hellfire missile to attack a vehicle in Yemen that killed six al-Qaeda operatives, and the implications of this new capability are still being considered (Scud Seizure, 2002).

Each military service also uses science boards to perform an annual assessment and review of relevant research and technology to help characterize and solve recognized areas of uncertainty. The role of science boards in providing access to external technology experts is clear in the purpose of the Air Force Scientific Advisory Board (SAB) to provide a "link between the Air Force and the scientific community" (Air Force Scientific Advisory Board). The science boards complement internal research by promoting the exchange of the latest research. Additionally, science boards take the additional steps of considering the impacts of advancing technology and making recommendations on promising areas of technology development. This can be achieved by having personnel familiar with requirements and technology represented on science boards, so they can help direct research projects into high payoff areas.

VENTURING

The military has created an organization that manages and directs selected research and development projects, or serves a venturing function. With a 2004 budget exceeding $2.9 billion, the Defense Advanced Research Projects Agency (DARPA) funds basic and applied research, technology demonstrations, and R&D management (Defense Advanced Research, 2003). Created in 1958, in response to the Soviet launch of Sputnik, the stated mission of DARPA is to "... maintain the technological superiority of the U.S. military and prevent technological surprise from harming our national security by sponsoring revolutionary, high-payoff research that bridges the gap between fundamental discoveries and their military use" (Defense Advanced Research, 'Mission').

The DARPA does not have onsite laboratories and instead focuses on bringing experts with similar interests together to encourage the nonlinear generation of ideas (Defense Advanced Research Projects Agency, 'Bridging,' 2004). The DARPA has been highly successful. For example, DARPA's involvement contributed to the development and subsequent fielding of the F-117 stealth fighter. The DARPA provides the military a method of seeking technology opportunities and a means to adapt to advancing technology to help meet military needs.

COMPETITIVE INTELLIGENCE

Innovation does not occur in a vacuum, and organizations must consider the pool of knowledge available in their external environment. The most immediate threat to any organization involves the capabilities of its competitors, and the military has developed internal resources to monitor and evaluate foreign technology. During the cold war, the attention paid to foreign technology even included covert means. For example, during the Korean War, Soviet Mig-15 fighter aircraft were recovered and evaluated by military experts and defense firms that influenced engagement tactics for the Air Force F-86 (Air Force Historical Studies Office). Additionally, a recently declassified operation called Project Alpha involved clandestinely obtaining, flight-testing, and returning a Soviet Yak-23 fighter in 1953 (Getz, 2004). While not covert, the success of Operation Desert Storm has been partially attributed to the Army sending units to train against a "red" team using Soviet tactics and equipment at Fort Irwin, CA, that provided military units familiarity with potential adversary equipment and tactics.

Based on the recognized importance of foreign technology, the military openly monitors external technology. For example, the Air Force has offices in Asia and Europe to identify foreign technological capabilities and accomplishments. The Asian office is located in Tokyo and the European office is colocated with similar Army and Navy offices in London. Personnel in the offices visit companies and conferences in the region, facilitate contact between scientists, and contract with foreign scientists to perform research.

The military also has established formal programs to encourage testing of external technology. The Foreign Comparative Testing (FCT) program evaluates external technology and avoids unnecessary duplication of R&D. The FCT program both advocates and funds programs to meet identified needs by testing already developed systems. Since 1989, calls for FCT proposals are distributed throughout each U.S. armed service, the defense industry, and foreign governments for evaluation of foreign systems that are currently in production.

Over the life of the program, FCT has saved hundreds of millions of dollars in unnecessary R&D by procuring already developed systems. For example, the AGM-142 Have Nap air-to-ground missile procured by the Air Force from Israel avoided an estimated $160 million in development costs. Recent FCT success stories include the use of Swedish portable satellite communication equipment and British chemical agent detectors during Operation Iraqi Freedom (DUSD). Funding invested in the FCT program represents a leveraging investment with subsequent armed

service procurement funding exceeding FCT investments by a 7:1 ratio on average (Vanderwerf, 1996).

OUTSOURCING R&D

The U.S. military also relies on external experts to advise senior leaders on research, technology, manufacturing, and other items of special interest. The U.S. military's commitment to supporting independent research is significant. For example, in 2002, over $27 million in direct funding was provided to independent research centers and over $1.5 billion in funding supported science and engineering research by universities and colleges (Department of Defense, Comptroller, 2004; Vanderwerf, 1996). This funding helps support eleven Federally Funded Research and Development Centers (FFRDCs) and six University Affiliated Research Centers (UARCs).

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The FFRDCs receive the majority of their funding from the government and perform studies and analysis, research and development, and systems engineering tasks under long-term contracts that facilitate attracting and retaining high-quality personnel. Additionally, FFRDCs maintain independence and provide needed objectivity in analysis and recommendations for the government. A 1997 DSB study reinforced the continuing need for FFRDCs, but recognized that reliance on these research centers alone may isolate the DoD from important sources of new technology (Defense Science Board Task Force, 1997). This finding highlights the importance of maintaining a diverse set of innovation strategies.

The UARCs agreements involve specific technology areas that would otherwise have limited R&D sources available, and involve long-term agreements to facilitate collaboration on research. The result is an augmentation of government research capabilities that has had a significant impact on technology development. For example, the largest DoD-sponsored UARC, Johns Hopkins University's Applied Physics Laboratory (APL), invented the concept of satellite navigation that resulted in the Global Positioning System (GPS). Additionally, the educational aspect of universities cultivates future human resources in technology and science that helps ensure a future supply of technical personnel.

The Air Force also stimulates technology research by small businesses through the government's Small Business Innovation Research (SBIR) program. The SBIR is designed to stimulate and develop innovative research by small businesses.

Entrepreneurs with technical expertise often pursue disruptive innovations that established organizations ignore. By supporting small businesses, the military encourages research that may not otherwise be pursued and ensures its feasibility is explored.

SUBSIDIZING R&D

Dating from the Vinson-Trammell Act of 1934, defense contractor R&D costs have been recognized as an allowable cost under military contracts (Department of Defense, Independent Research, 2002). The practice encourages R&D within the defense industry by allowing contractors to recover the majority of basic R&D costs, and it helps ensure future military needs can be met.

A remaining concern is that IR&D is largely limited to firms that are primarily in the defense industry and is not available to subsidize research in commercial firms.

Since the mid-1990s, a database of IR&D projects identifying contractor capabilities helps avoid duplication of effort between DoD laboratories and defense contractors. The database also helps to increase awareness of the different technologies being pursued, and avoiding such examples as when Lockheed was unintentionally excluded from competing on the DARPA contract to develop a prototype stealth aircraft that it eventually won, because the military was not aware of Lockheed's internally developed capabilities (Lorell, 2003). A remaining concern is that IR&D is largely limited to firms that are primarily in the defense industry and is not available to subsidize research in commercial firms.

SPONSOR COMPETITIONS

Another approach to military innovation managed by DARPA involves competitions that award special prizes. These competitions encourage entrepreneurial thinking and technical accomplishments. One example involves a $2 million award for a fully autonomous, unmanned ground vehicle to transverse a desert route in less than 10 hours (Defense Advanced Research Projects Agency, 2006). Competitions increase the diversity of solutions considered and helps drive technology maturation. The implication for the military is that technology is made available for military applications faster.

APPLYING MILITARY INNOVATION MANAGEMENT LESSONS

The military places a greater emphasis on basic research than most organizations. However, innovation management as practiced by the military extends further. The military actively performs and supports R&D, monitors external technology, and employs external experts to both perform research and evaluate external technology. The specific innovation strategies used by the military highlight innovation management strategies that can be more widely adopted. The pattern of success the U.S. military displays in guiding innovation results from a diverse approach to innovation management. This diversity facilitates the pursuit of both incremental and radical innovations, and receiving feedback from both technology experts and actual users. Managers may want to consider the following lessons in order to better adapt to and drive change.

MAINTAIN CENTERS OF EXCELLENCE

Innovation in an organization begins by attracting experts driven to pursue advances in technology, products, and processes. This is not intended as an endorsement of central research laboratories, as needed knowledge in a dynamic environment is widely dispersed. However, taking advantage of external knowledge requires internal experts to monitor, access, and understand new technologies and information. These internal experts will also be required to facilitate other innovation strategies. Leading companies today and in the future will continue to invest in R&D and other areas to maintain innovation capability, but it will be more focused on core areas critical to the organization and dispersed beyond central laboratories.

EXPAND THE USE OF PRODUCT EXPERIMENTS

Organizations can further apply what the military gains by demonstrating technology with real users. Instead of using randomly generated groups for market testing, organizations should seek out *lead users* to more rapidly develop products at less cost. Lead users are people who have a better understanding of what new products need and may think of additional applications as they use a product. Minnesota Mining and Manufacturing (3M) has applied the lead user concept, and products developed this way have eight times higher forecast sales than traditional development and are contributing to higher new product generation (Lilien, et al., 2002).

DEVELOP PERSONNEL

Organizations need to establish formal programs to develop their most important assets—their people. Managers need to establish and support exchange programs with key organizations such as universities and suppliers. The people sent on these assignments also need to be carefully selected and motivated by increased responsibility in subsequent assignments. This will help ensure retention of these future leaders and that they have the right skills and experience for later leadership

positions. Another opportunity is sponsoring employees for advanced degrees. Sponsoring education can build employee loyalty and allow a company the benefits of employees with more robust networks. Informal knowledge trading by experts is an important and inexpensive method of obtaining needed information (vonHippel, 1988). Additionally, these programs can help identify key talent for hire at suppliers or universities.

RETAIN EXTERNAL EXPERTS

Retaining experts to form the core of a *science board* that can monitor and report on important technology and trends can expand the benefits of cross-fertilization. Organizations may want to consider establishing a formal *technology* subcommittee to their board of directors to investigate special topics that could have implications for their organization or market. The technology committee would operate similar to audit and compensation committees. Technology committees are more common in pharmaceutical firms, and more organizations and industries could benefit from having a formal focus on their board of directors by increasing the understanding of relevant technologies and how they are changing (Bjelland & Wood, 2005).

INSTITUTIONALIZE VENTURING

Organizations often apply venturing on an ad hoc basis, while the DoD has specialized organizations (e.g., DARPA) for encouraging advanced technology development. Systematic support of venturing can increase the legitimacy of nurturing radical technology that may otherwise threaten an organization. Venturing should be about encouraging and monitoring technology that could have a material impact on an organization's operations. For example, Intel Capital began with the goal of investing in technology relating to Intel's core products and resulted in significant gains and technology advances (Lord, deBethizy, & Wager, 2005). Managers should consider formalizing venturing to pursue opportunities and ensure efforts are aligned with their organization's needs.

MONITOR COMPETITOR PRODUCTS

Weapon systems already in use by foreign countries are actively sought and tested for potential solutions to U.S. military needs. Organizations can employ this to use available solutions and avoid unnecessary duplication of R&D. However, testing of competitor products can be used as a form of competitive intelligence to learn about or reverse engineer competitor products. While not widely advertised, organizations do test competitor products. For example, General Motors, under Project Mona Lisa, dismantled competitor automobiles to learn more about their manufacture and design (Diamond, 2005). Testing of competitor products raises ethical questions, but ignoring that it exists fails to recognize an avenue that disseminates knowledge (Lubit, 2001).

OUTSOURCE R&D

Supporting external R&D provides access to additional information and helps create a market for technology (Arora, Fosfuri & Gambardella, 2001). Outsourcing R&D may allow specialized organizations to attract talented researchers with better incentives than internal R&D can support, and it may be the only viable option if internal resources do not exist. This is particularly true when developed knowledge is useful to multiple users. In these situations, dividing innovative labor may provide efficiencies in developing knowledge. When organizations need knowledge, managers need to stop and consider that it may be available from others.

PROMOTE SUPPLIER R&D

The military recognizes that suppliers play an active role in innovation and it underwrites the costs of supplier R&D. Organizations are embedded within a network and managers may want to take a more active role in leveraging other organizations' capabilities by more actively encouraging and using vendor design expertise (Neely & Dehoff, 2004). For example, Boeing has developed supplier relationships as part of an outsourcing program that provides the benefits of increased supplier expertise and agility and lower overhead costs (Destefani, 2004).

SPONSOR TECHNOLOGY COMPETITIONS

Commercial firms consistently support business case and other competitions, and they could reap similar benefits from expanding the underlying idea to include support of technology contests. Technology competitions leverage an organization's investment in prize money by having multiple competitors spend their own time and funds to *win* the sponsored competition and associated prestige. The benefit to a sponsoring organization is exposure to novel ideas and media attention on technology that may have a beneficial side effect in developing markets for that technology.

CONCLUSION

The options available to organizations in managing innovation extend beyond generic strategies. Improving the effectiveness of innovation requires managers to employ a balance of specific strategies to manage innovation. While the ideas presented here are not *new* on an individual basis, their application within the military as part of a more comprehensive approach to innovation suggests their adoption could benefit a broader audience.

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ENDNOTES

1. To view a list of Nobel Prize-winning research supported by the Air Force, see http://www.afosr.af.mil/afrnobel.htm

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